Exponential notation	Quaternary polynomial notation	Binary polynomial notation of $GF(16)$ on $GF(2)$	Hexadecimal notation
0	0	0	0
α^0	1	1	1
α^1	X	x	2
α^2	$x+2$	x^2	4
α^3	$3x+2$	x^3	8
α^4	$x+1$	$x+1$	3
α^5	2	x^2+x	6
α^6	$2x$	x^3+x^2	C
α^7	$2x+3$	x^3+x+1	B
α^8	$x+3$	x^2+1	5
α^9	$2x+2$	x^3+x	A
α^{10}	3	x^2+x+1	7
α^{11}	$3x$	X^3+x^2+x	E
α^{12}	$3x+1$	x^3+x^2+x+1	F
α^{13}	$2x+1$	X^3+x^2+1	D
α^{14}	$3x+3$	x^3+1	9

Table I

Fig. 1

Exponential notation	Binary polynomial notation of $GF(4)$ on $GF(2)$	Quaternary notation
0	0	0
α^0	1	1
α^1	X	2
α^2	$X+1$	3

Table II

Fig. 2

Exponential notation	Quaternary polynomial notation	Binary polynomial notation	Hexadecimal notation
0	0	0	0
α^0	1	1	1
α^1	X	x	2
α^2	$X+2$	x^2	4
α^3	$3x+2$	x^3	8
α^4	$X+1$	x^3+1	9
α^5	2	x^3+x+1	B
α^6	$2x$	X^3+x^2+x+1	F
α^7	$2x+3$	x^2+x+1	7
α^8	$X+3$	x^3+x^2+x	E
α^9	$2x+2$	x^2+1	5
α^{10}	3	x^3+x	A
α^{11}	$3x$	x^3+x^2+1	D
α^{12}	$3x+1$	$x+1$	3
α^{13}	$2x+1$	x^2+x	6
α^{14}	$3x+3$	x^3+x^2	C

Table III

Fig. 3

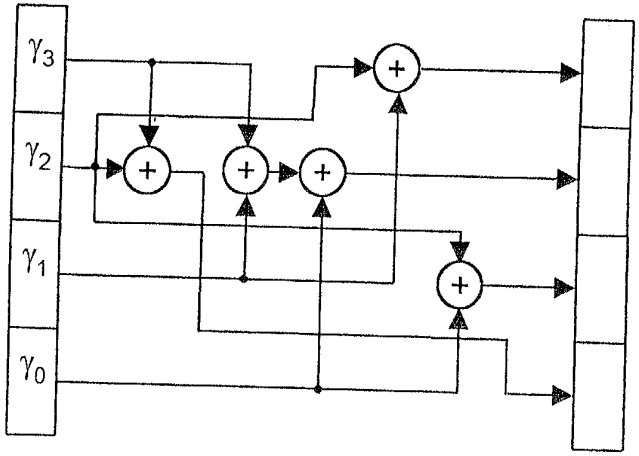

Fig.4a

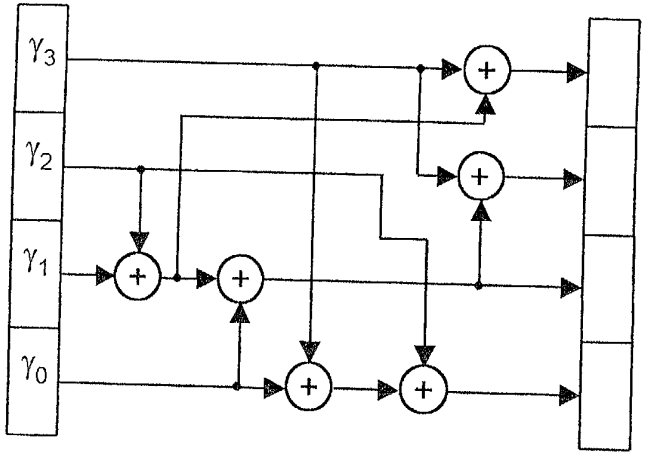

Fig.4b

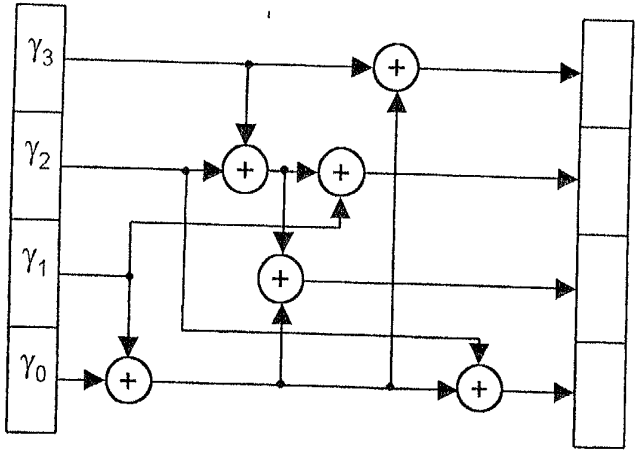

Fig.5a

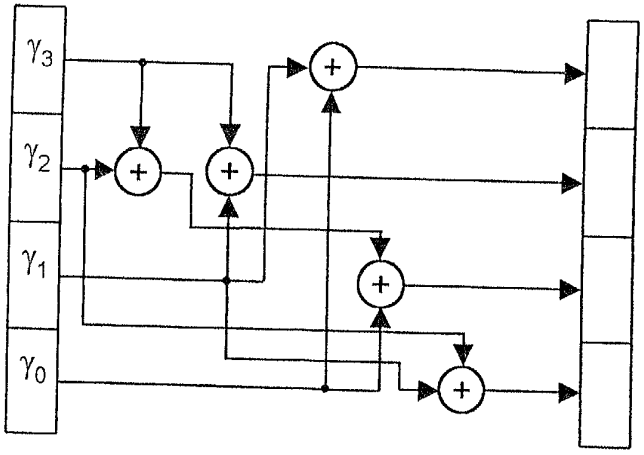

Fig.5b

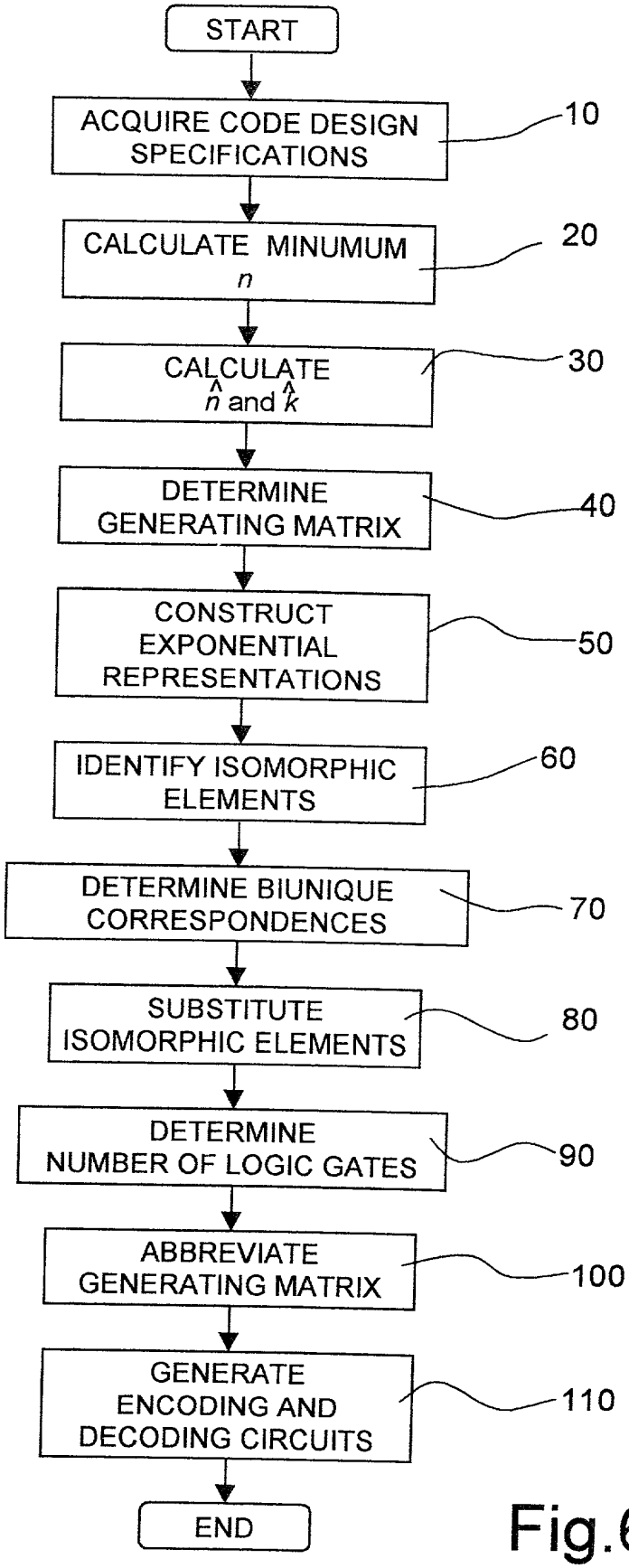
START
ACQUIRE CODE DESIGN SPECIFICATIONS
10
CALCULATE MINUMUM n
20
CALCULATE n̂ and k̂
30
DETERMINE GENERATING MATRIX
40
CONSTRUCT EXPONENTIAL REPRESENTATIONS
50
IDENTIFY ISOMORPHIC ELEMENTS
60
DETERMINE BIUNIQUE CORRESPONDENCES
70
SUBSTITUTE ISOMORPHIC ELEMENTS
80
DETERMINE NUMBER OF LOGIC GATES
90
ABBREVIATE GENERATING MATRIX
100
GENERATE ENCODING AND DECODING CIRCUITS
110
END

Fig.6

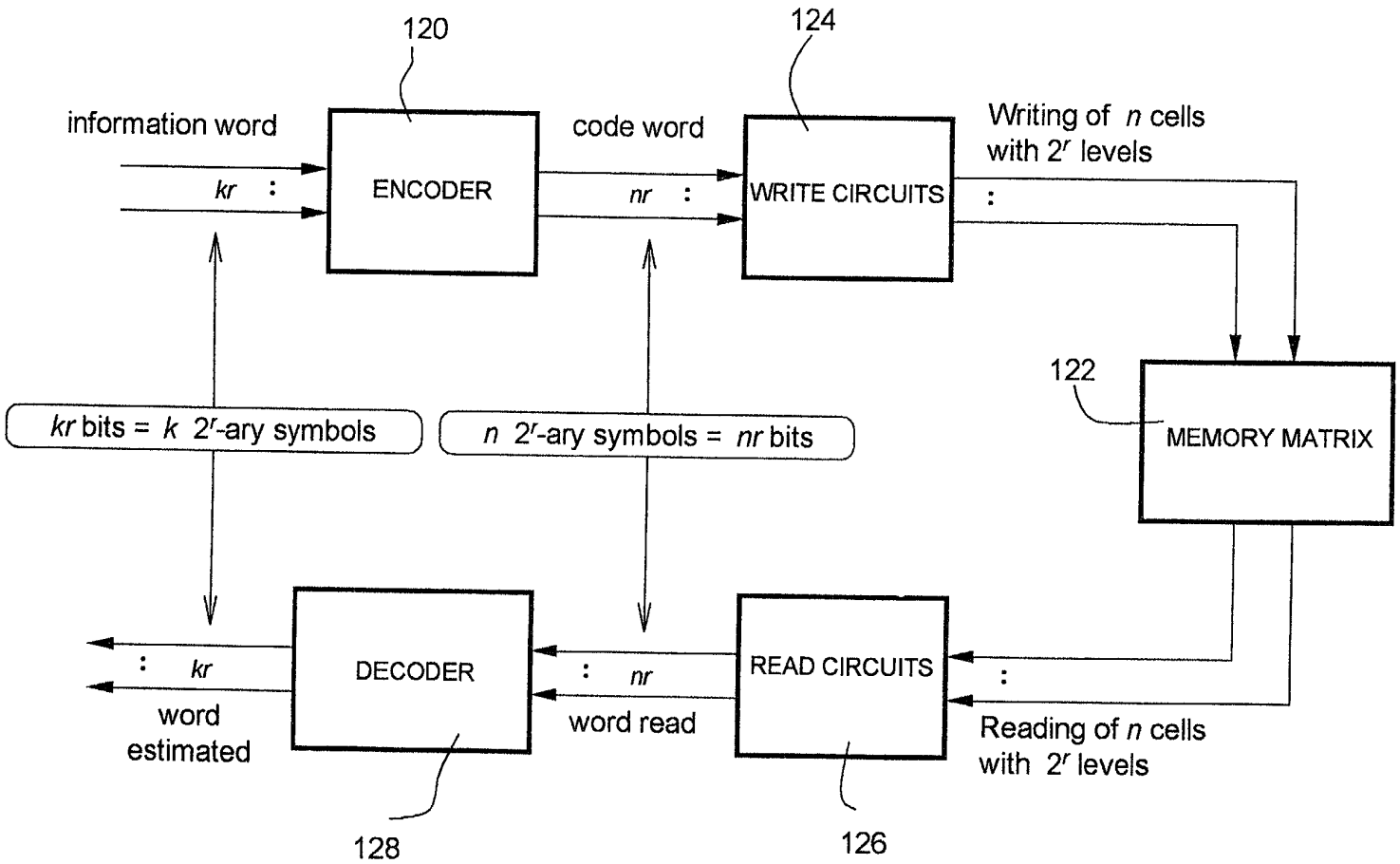
120
124
information word
kr :
ENCODER
code word
nr :
WRITE CIRCUITS
Writing of n cells
with 2^r levels
:
122
MEMORY MATRIX
kr bits = k 2^r-ary symbols
n 2^r-ary symbols = nr bits
: kr
word
estimated
DECODER
: nr
word read
READ CIRCUITS
:
Reading of n cells
with 2^r levels
128
126

Fig. 7

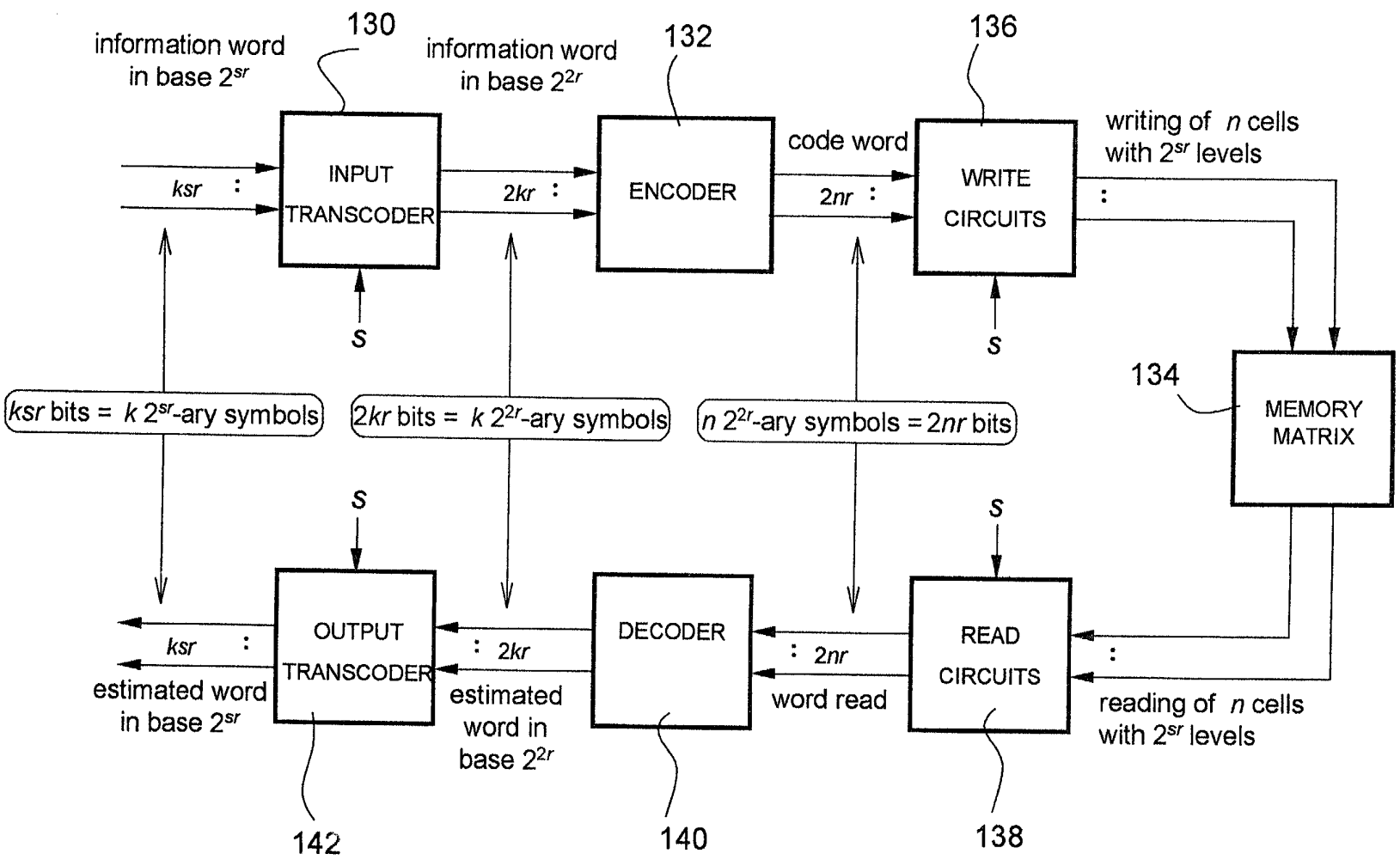
information word in base 2^{sr}
130
information word in base 2^{2r}
132
136
writing of n cells with 2^{sr} levels
code word
INPUT TRANSCODER
ENCODER
WRITE CIRCUITS
ksr :
$2kr$:
$2nr$:
:
s
s
134
MEMORY MATRIX
ksr bits = k 2^{sr}-ary symbols
$2kr$ bits = k 2^{2r}-ary symbols
n 2^{2r}-ary symbols = $2nr$ bits
s
s
OUTPUT TRANSCODER
DECODER
READ CIRCUITS
ksr :
: $2kr$
: $2nr$
:
estimated word in base 2^{sr}
estimated word in base 2^{2r}
word read
reading of n cells with 2^{sr} levels
142
140
138

Fig.8